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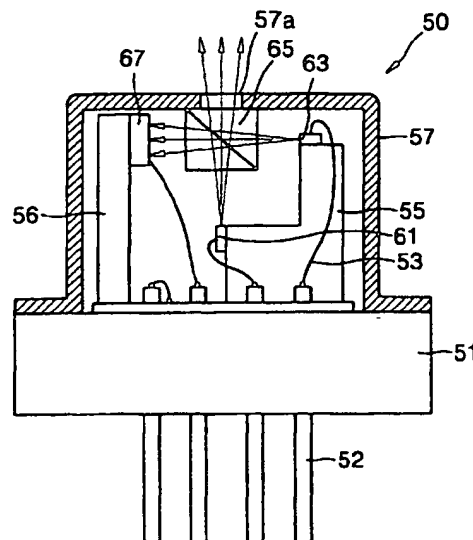
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(54) **Light emitting module and compatible optical pickup device adopting the same**

(57) A light emitting module packaging two light sources (61, 63) emitting two light beams of different wavelengths, and a compatible optical pickup device adopting the module are provided. The light emitting module includes a base (51), first and second light sources (61, 63) installed on the base (51), for emitting laser beams in different wavelength regions, a beam splitter (65) and a monitoring photodetector (67) for monitoring the optical outputs of the first and second light sources (61, 63) by receiving the beams emitted from the first and second light sources (61, 63) and split from the beam splitter (65) in one direction. Also, another light emitting module includes a substrate (111), first and second light sources (121, 131) installed on the substrate (111) for emitting laser beams of first and second wavelengths from both lateral sides thereof, a reflection member (115) for reflecting the laser beam emitted from one lateral side of each of the first and second light sources (61, 63) to proceed in one direction, and first and second monitoring photodetectors (125, 135) for monitoring optical outputs of the first and second light sources (121, 131). A compatible optical pickup device includes a light emitting module having one of the above structures, an objective lens for focusing first and second laser beams on an optical recording medium, an optical path converting device, a grating arranged on an optical path between the light emitting module and the optical path converting device for diffracting and transmitting an incident light, and a photo-

detector.

FIG. 3



[0014] In the process of adjustment of the first and second optical modules 20 and 30 and the photodetector 40 of the compatible pickup device having the above structure, first, the photodetector 40 is adjusted so that reproduction of servo and RF signals is possible by fixing the first optical module 20 including the semiconductor laser 23 for emitting light of a 650nm wavelength and disposing the light emitted from the first optical module 20 and reflected by the optical disk 10 after passing the first and second beam splitters 12 and 14 and the objective lens 11, at the photodetector 40. Then, the second optical module 30 is adjusted so that the light emitted from the second optical module 30 and reflected by the optical disk 10 can accurately focused on the photodetector 40.

[0015] Thus, the conventional compatible optical pickup device having the above structure has the drawbacks as follows.

[0016] First, as at least one of the first optical module, the second optical module and the photodetector must be adjusted, assembly is inconvenienced and the rate of assembly defects increases.

[0017] Second, as the first and second optical modules are adopted in the separated locations, miniaturization of the optical pickup is difficult.

[0018] Third, as two monitoring photodetectors for adjusting the optical output of each light source are required, a circuit wiring is complicated.

[0019] With a view to solve or reduce the above problems, it is an aim of embodiments of the present invention to provide a light emitting module having an improved structure by which the optical configuration is simplified and the number of the parts are reduced and a compatible optical pickup device adopting the same.

[0020] According to a first aspect of the present invention there is provided a light emitting module comprising: a base; first and second light sources installed on the base, for emitting laser beams in different wavelength regions; a beam splitter for splitting the beams emitted from the first and second light sources; and a monitoring photodetector for monitoring the optical outputs of the first and second light sources by receiving the beams emitted from the first and second light sources and split from the beam splitter in one direction.

[0021] According to a second aspect of the invention, there is provided an optical pickup device comprising: a light emitting module having a base, first and second light sources installed on the base, for emitting laser beams in different wavelength regions, a beam splitter for splitting the beams emitted from the first and second light sources, and a monitoring photodetector for monitoring the optical outputs of the first and second light sources by receiving the beams emitted from the first and second light sources and split from the beam splitter in one direction; an objective lens disposed on the optical path between the light emitting module and an optical recording medium, for focusing the beams emitted from the first and second light sources onto the optical recording medium; an optical path converting device disposed on the optical path between the light emitting module and the objective lens, for converting the proceeding path of an incident beam; and a photodetector for receiving the beams emitted from the first and second light sources, reflected from the optical recording medium and input via the optical path converting device.

[0022] The module or device may comprise a heat sink on the base, and wherein the first and second light sources are mounted on a lateral surface of and on the top surface of the heat sink.

[0023] The device or module preferably comprises a cap having an emission hole through which the beams emitted from the first and second light sources and split from the beam splitter in different directions are emitted and installed on the base to enclose the first and second light sources, the beam splitter and the monitoring photodetector.

[0024] The emission hole of the cap is preferably sealed by the beam splitter.

[0025] According to a third aspect of the invention, there is provided a light emitting module comprising: a substrate; a first light source, installed on the substrate, for emitting a laser beam of a wavelength from both lateral sides thereof; a second light source, installed on the substrate by being separated a predetermined distance from the first light source, for emitting a laser beam of a wavelength different from that of the laser beam emitted from the first light source from both lateral sides thereof; a reflection member, arranged on the substrate between the first light source and the second light source, for reflecting the laser beam emitted from one lateral side of each of the first and second light sources to proceed in one direction; first and second monitoring photodetectors for receiving the laser beam emitted from the other lateral side of each of the first and second light sources and monitoring optical outputs of the first and second light sources; a package frame encompassing the substrate, the first and second light sources, the reflection member and the first and second photodetectors; and a lead frame formed by penetrating the package frame and wire-bonded to the first and second light sources and the first and second monitoring photodetectors.

[0026] According to a fourth aspect of the invention, there is provided an optical pickup device comprising: a light emitting module including a substrate, first and second light sources installed on the substrate for emitting laser beams of first and second wavelengths from both lateral sides thereof, a reflection member arranged on the substrate between the first and second light sources for reflecting the laser beam emitted from one lateral side of each of the first and second light sources to proceed in one direction, and first and second monitoring photodetectors for receiving the laser beam emitted from the other lateral side of each of the first and second light sources and monitoring optical outputs of the first and second light sources; an objective lens arranged on an optical path between the light emitting module and an optical recording medium for focusing the incident first and second laser beams on the optical recording medium; an

Figure 9 is a view showing the optical arrangement of the compatible optical pickup device according to a second preferred embodiment; and

Figure 10 is a view showing the optical arrangement of the photodetector of the compatible optical pickup device according to a second preferred embodiment.

[0034] Referring to Figure 3, a light emitting module 50 according to the present invention includes a base 51, first and second light sources 61 and 63 provided on the base 51, for emitting laser beams in different wavelength regions, a beam splitter 65 for splitting the beams emitted from the first and second light sources 61 and 63, a monitoring photodetector 67 for monitoring the optical outputs of the first and second light sources 61 and 63 by receiving the beams split from the beam splitter 65 in one direction, and a cap 57 provided on the base 51 and enclosing the first and second light sources 61 and 63, the beam splitter 65 and the monitoring photodetector 67.

[0035] First and second heat sinks 55 and 56 are further provided on the base 51. The first light source 61 is installed on a lateral surface of the first heat sink 55 and emits a beam in a vertical direction with respect to the base 51. The second light source 63 is installed on the top surface of the first heat sink 55 and emits a beam in a direction parallel to the base 51. Also, the monitoring photodetector 67 is installed on a lateral surface of the second heat sink 56 to face the second light source 63 with the beam splitter 65 disposed therebetween.

[0036] The first and second light sources 61 and 63 and the monitoring photodetector 67 are electrically connected to an external driver (not shown) by wires 53 and a plurality of leads 52 installed to penetrate the base 51. The first and second light sources 61 and 63 are semiconductor lasers for irradiating beams having different wavelengths. For example, the first light source 61 emits a beam in a wavelength region of approximately 635 to 650 nm, and the second light source 63 emits a beam in a wavelength region of approximately 780 nm.

[0037] The beam splitter 65 is disposed between the first and second light sources 61 and 63 and the monitoring photodetector 67 and makes most of beams emitted from the first and second light sources 61 and 63 directed outside the cap 57 through an emission hole 57a formed on the cap 57 and a part of the beams directed to the monitoring photodetector 67. Here, the emission hole 57a is preferably sealed by the beam splitter 65.

[0038] The monitoring photodetector 67 utilizes the split beam via the beam splitter 67 among the beams emitted from the first and second light sources 61 and 63. In other words, part of effective beams emitted from the first and second light sources 61 and 63 is used. Since the beams emitted to the rear surfaces of the first and second light sources 61 and 63 are not necessary, the structures of the first and second light sources 61 and 63 can be improved such that the reflectivity is substantially 99% or more, thus improving the optical output efficiency. Also, since the life of a semiconductor laser is proportional to the square of the optical output thereof, the life can be greatly prolonged.

[0039] In the light emitting module 50 having the aforementioned configuration, the assembly work for coinciding the illumination points of the first and second light sources 61 and 63 is performed using a system shown in Figure 4.

[0040] The beam emitted from the first light source 61 of the light emitting module 50 and diverging via the beam splitter 65 is enlarged and formed on a CCD (Charge Coupled Device) camera 85 through a collimating lens 81 and a focusing lens 83. Here, while the spot formed on the CCD camera 85 is observed by enlarging the same through a monitor 90, the position of the first light source 61 is adjusted and to fix it on the lateral surface of the first heat sink 55. Then, while the spot formed on the CCD camera 85 is observed through the monitor 90, the position of the second light source 63 is adjusted to then be fixed on the top surface of the first heat sink 55.

[0041] Referring to Figures 3 and 5, the compatible optical pickup device according to the present invention includes the light emitting module 50 having the first and second light sources 61 and 63 integrally formed therein, an objective lens 77 for focusing the beams emitted from the first and second light sources 61 and 63 onto an optical recording medium 1, a light path converting device for converting the proceeding path of an incident beam, and a photodetector 80 for receiving the beams emitted from the first and second light sources 61 and 63, reflected from the optical recording medium 1 and then input via the light path converting device. Here, as the structure of the light emitting module 50 is the same as that described with reference to Figure 3, a description thereof will be omitted.

[0042] The first light source 61 is used when a relatively thin optical disk 1a, for example, a DVD, is employed as the optical recording medium 1, and emits a laser in a wavelength region of approximately 635 to 650 nm. The second light source 63 is used when a relatively thick optical disk 1b, for example, a CD, is employed as the optical recording medium 1, and emits a laser in a wavelength region of approximately 780 nm.

[0043] Referring to Figure 6, the beam splitter 65 is designed to transmit approximately 90% of beams with respect to the about 650 nm wavelength region and approximately 10% of beams with respect to the about 780 nm wavelength region. That is, the beam splitter 65 transmits most of the beams emitted from the first light source 61 and reflects part of the beams. Also, the beam splitter 65 reflects most of the beams emitted from the second light source 63 and transmits part of the beams. Thus, most of the beams emitted from the first and second light sources 61 and 63 are directed toward the optical recording medium 1 via the beam splitter 65 and only part of the beams is directed to the monitoring photodetector 67.

space is made by etching.

[0060] The first light source 121 is installed in the inner space of the substrate 111 and emits a laser beam of a predetermined wavelength, for example, 650 nm, from both lateral sides thereof. Of the lights emitted from the first light source 121 in two directions, the light in one direction proceeds toward the reflection member 115 and the light in the other direction proceeds toward the first monitoring photodetector 125.

[0061] The second light source 131 is installed on the substrate 111 by being separated a predetermined distance with respect to the first light source 121 and emits a laser beam of a predetermined wavelength, for example, 780 nm, from both lateral sides thereof. The light in one direction of the lights emitted by the second light source 131 in two directions proceeds toward the reflection member 115 and the light in the other direction proceeds toward the second monitoring photodetector 135.

[0062] Preferably, in the inner space of the substrate 111, a pair of guide grooves 111a and 111b for guiding the positions where the first and second light sources 121 and 131 are attached are formed to be indented at the positions where the first and second light sources 121 and 131 are attached. Thus, by minimizing an error in the attachment of the first and second light sources 121 and 131 with respect to the substrate 111, the amount of relative shift of the optical axes of the first and second light sources 121 and 131 can be accurately controlled.

[0063] The reflection member 115 is installed at the substrate 111 between the first and second light sources 121 and 131 and makes the laser beam emitted from one side of each of the first and second light sources 121 and 131 proceed in one direction. The reflection member 115 is integrally formed with the substrate 111 and includes a base 113 having the first and second surfaces 113a and 113b arranged to be inclined a predetermined angle with respect to each of the first and second light sources 121 and 131, and first and second reflection portions 115a and 115b formed at the first and second surfaces 113a and 113b for reflecting the light input from the first and second light sources 121 and 131.

[0064] The base 113 is formed by etching the substrate 111 when the inner space is formed, and the angles between the first surface 113a and the substrate 111, and the second surface 113b and the substrate 111 are preferably 45°. Here, as the silicon selected as a material for the substrate 111 has a crystalline structure of a cubic shape, the etching at an angle of 45° is easy. The first and second reflection portions 115a and 115b are preferably formed by reflection coating on the first and second surfaces 113a and 113b of the base 113. Thus, the two lights emitted from the first and second light sources 121 and 131 and reflected by each of the first and second reflection portions 115a and 115b proceed parallel to each other while maintaining a distance d_1 between the optical axes thereof.

[0065] Also, it is preferable that length l_2 of the optical axis between the exhaust surface 131a of the second light source 131 and the reflection member 115 is arranged to be relatively greater than length l_1 of the optical axis between the exhaust surface 121a of the first light source 121 and the reflection member 115. This is to consider the change in size of the section of the exhaust light due to the difference in wavelength of the exhaust light when the light is emitted from the first and second light sources 121 and 131 and passes the optical elements.

[0066] The respective first and second photodetectors 125 and 135, arranged on the substrate 111, receives the lights emitted from the first and second light sources 121 and 131 to monitor the optical outputs of the first and second light sources 125 and 135, respectively. Here, the first and second monitoring photodetectors 125 and 135 are preferably manufactured through a semiconductor process of depositing a p-type semiconductor layer and an n-type semiconductor layer at the corresponding positions on the substrate 111. Also, it is possible to manufacture the first and second monitoring photodetectors 125 and 135 through the semiconductor process with respect to an additional substrate (not shown) and attach them on the side wall of the substrate.

[0067] The package frame 141 encompasses the substrate 111, the first and second light sources 121 and 131, a reflection member 115 and the first and second monitoring photodetectors 125 and 135, thus incorporating them in a package. The package frame 141 is formed of a material such as molding resin.

[0068] The lead frames 145 penetrate the package frame 141 and each end thereof is wire-bonded to the first and second light sources 121 and 131 and the first and second monitoring photodetectors 125 and 135. The lead frames 145 consist of one lead for grounding the substrate 111, two leads for providing driving power to each of the first and second light sources 121 and 131, and one lead for transmitting electric signals detected by the first and second monitoring photodetectors 125 and 135. Here, as the first and second light sources 121 and 131 are selectively driven, it is possible to commonly use a single lead with respect to the first and second monitoring photodetectors 125 and 135.

[0069] Referring to Figures 9 and 10, a compatible optical pickup device according to a second preferred embodiment of the present invention includes a light emitting module 100, an objective lens 159 for focusing the light emitted from the light emitting module 100 on an optical recording medium 1, an optical path converting device 153 for converting a proceeding path of the incident light, a grating 151 arranged on the optical path between the light emitting module 100 and the optical path converting device 153 for diffracting and transmitting the incident light, a photodetector 170 for receiving the incident light which is emitted from the light emitting module 100, reflected by the optical recording medium 1 and passes the optical axis converting device 153, and a holographic device 161 arranged on the optical axis between the optical path converting device 153 and the photodetector 170.

CD track error signal = E - F

DVD, CD information signal = A+B+C+D+G+H

5 [0082] Also, it is preferable that the optical pickup device according to the present invention further includes optical elements such as a mirror 157 arranged on the optical axis between the beam splitter 154 and the objective lens 159 for converting the optical path by reflecting the incident light, and a collimating lens 155 for making a parallel beam by focusing divergent light which is input.

10 [0083] In the operation of the compatible optical pickup device having the above structure, when the relatively thin optical disk 1a such as a DVD is adopted as the optical recording medium 1, the light emitted from the first light source 121 is used. That is, the light emitted from the first light source 121 transmits the beam splitter 154 and makes a parallel beam by the collimating lens 155 and is reflected by the mirror 157 to proceed to the objective lens 159. The objective lens 159 makes the incident light to focus on the relatively thin optical disk 1a. The light reflected by the optical disk 1a passes the objective lens 159, the mirror 157 and the collimating lens 155 and proceeds to the beam splitter 154. The light is reflected by the beam splitter 154 and the holographic device 161 diffracts the +1st-order light and -1st-order light thereof to focus on the first through four photodetectors 171, 173, 175 and 177. The first through four photodetectors 171, 173, 175 and 177 detect, from the incident light, the information signal with respect to the relatively thin optical disk 1a, the track error signal by the phase difference method, and the focus error signal by the astigmatism method through the holographic device 161.

20 [0084] The light emitted to the rear of the first light source 121 focuses on the first monitoring photodetector 125 so that the optical output of the first light source 121 is controlled by an optical output control circuit (not shown) provided between the first monitoring photodetector 125 and the first light source 121.

25 [0085] When the relatively thick optical disk 1b such as a CD is adopted as the optical recording medium 1, the light emitted from the second light source 131 is used. That is, the light emitted from the second light source 131 transmits the beam splitter 154 after being diffracted into at least three beams by the grating 151 and proceeds to the optical recording medium 1. The light is focused by the objective lens 159 on the relatively thick optical disk 1b and then reflected therefrom and passes the objective lens 159, the beam splitter 154 and the holographic device 161 to focus on the first through fourth photodetectors 171, 173, 175 and 177. The first through four photodetectors 171, 173, 175 and 177 detect, from the incident light, the information signal with respect to the relatively thick optical disk 1b, the track error signal by the three beam method, and the focus error signal by the astigmatism method through the holographic device 161.

30 [0086] The light emitted to the rear of the second light source 131 and transmitting the beam splitter 154 focuses on the second monitoring photodetector 135 so that the optical output of the second light source 131 is controlled by an optical output control circuit (not shown) provided between the second monitoring photodetector 135 and the second light source 131.

35 [0087] The light emitting module and the compatible optical pickup device adopting the same according to the present invention having the above structure has the merits as follows.

[0088] First, as the first and second light sources are installed in a single optical module, the assembly of the optical pickup device is simplified like a DVD- or CD-dedicated optical pickup device.

40 [0089] Second, as the optical output signal obtained by the monitoring photodetector provided with respect to a plurality of wavelengths is used as a single optical output control signal, wiring of the optical output control circuit is simplified.

45 [0090] The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

[0091] All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

50 [0092] Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

55 [0093] The invention is not restricted to the details of the foregoing embodiment(s). The invention extend to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

light sources (121, 131) to proceed in one direction;

first and second monitoring photodetectors (125, 135) for receiving the laser beam emitted from the other lateral side of each of the first and second light sources (121, 131) and monitoring optical outputs of the first and second light sources (121, 131);

a package frame (141) encompassing the substrate (111), the first and second light sources (121, 131), the reflection member (115) and the first and second photodetectors (125, 135); and

a lead frame (145) formed by penetrating the package frame (141) and wire-bonded to the first and second light sources (121, 131) and the first and second monitoring photodetectors (125, 135).

7. An optical pickup device comprising:

a light emitting module (100) including a substrate (111), first and second light sources (121, 131) installed on the substrate (111) for emitting laser beams of first and second wavelengths from both lateral sides thereof, a reflection member (115) arranged on the substrate (111) between the first and second light sources (121, 131) for reflecting the laser beam emitted from one lateral side of each of the first and second light sources (121, 131) to proceed in one direction, and first and second monitoring photodetectors (125, 135) for receiving the laser beam emitted from the other lateral side of each of the first and second light sources (121, 131) and monitoring optical outputs of the first and second light sources (121, 131);

an objective lens (159) arranged on an optical path between the light emitting module (100) and an optical recording medium (1) for focusing the incident first and second laser beams on the optical recording medium (1);

an optical path converting device (153) arranged on an optical path between the light emitting module and the objective lens for converting a proceeding path of an incident light;

a grating (151) arranged on an optical path between the light emitting module and the optical path converting device for diffracting and transmitting an incident light;

a photodetector (170) for receiving an incident light emitted from the first and second light sources and reflected by the optical recording medium and passing the optical path converting device; and

a holographic device (161) arranged on an optical path between the optical path converting device (153) and the photodetector (170) for diffracting and transmitting an incident light.

8. The light emitting module as claimed in claim 6 or the device of claim 7, wherein the reflection member (115) comprises:

a base (113) integrally formed with the substrate (111) and including first and second surfaces (113a, 113b) having a predetermined degree of inclination; and

first and second reflection portions (115a, 115b), respectively formed at the first and second surfaces, (113a, 113b) for reflecting the incident lights emitted from the first and second light sources (121, 131).

9. The light emitting module as claimed in claim 6 or 8, or the module of claim 7 or 8, wherein the first and second light sources (121, 131) emit laser beams of about 650 nm and 780 nm wavelengths, respectively, and the first and second light sources (121, 131) are arranged such that the length on an optical axis between an exhaust surface of the second light source (131) and the reflection member (115) is relatively greater than the length on an optical axis between an exhaust surface of the first light source (121) and the reflection member (115).

10. The light emitting module as claimed in claim 6, 8 or 9 or the device of claim 7, 8 or 9, wherein, in the substrate (111), a pair of guide grooves (111a, 111b) for guiding the position where the first and second light sources (121, 131) are attached is formed to be indented at the positions where the first and second light sources are attached.

11. The light emitting module as claimed in any of claim 6, 8, 9 or 10 or the device of claim 7, 8, 9 or 10, further com-

FIG. 1 (PRIOR ART)

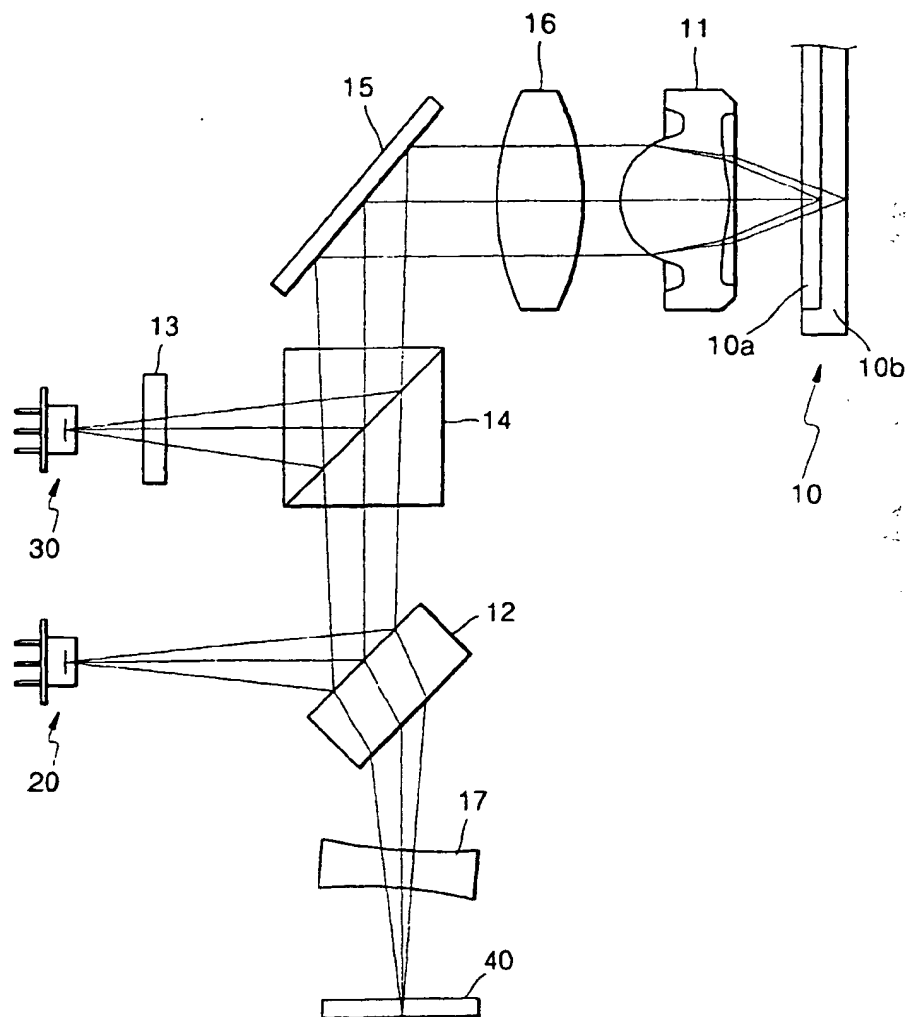


FIG. 3

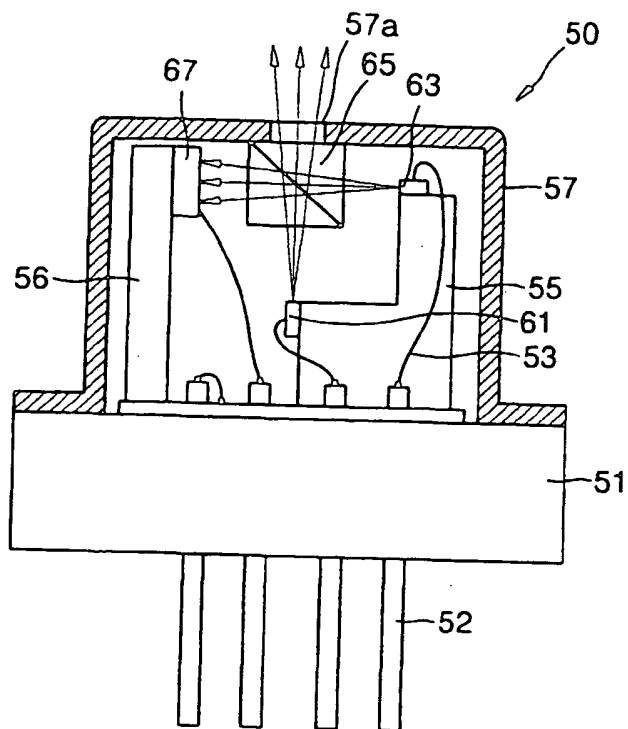


FIG. 6

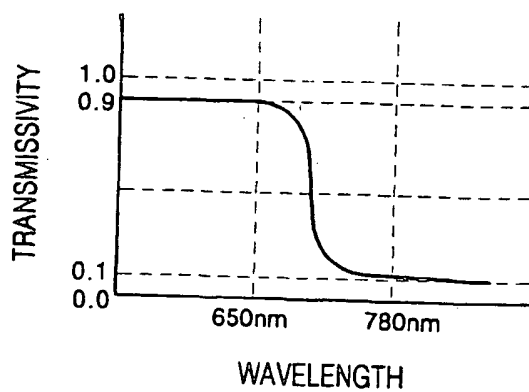


FIG. 5

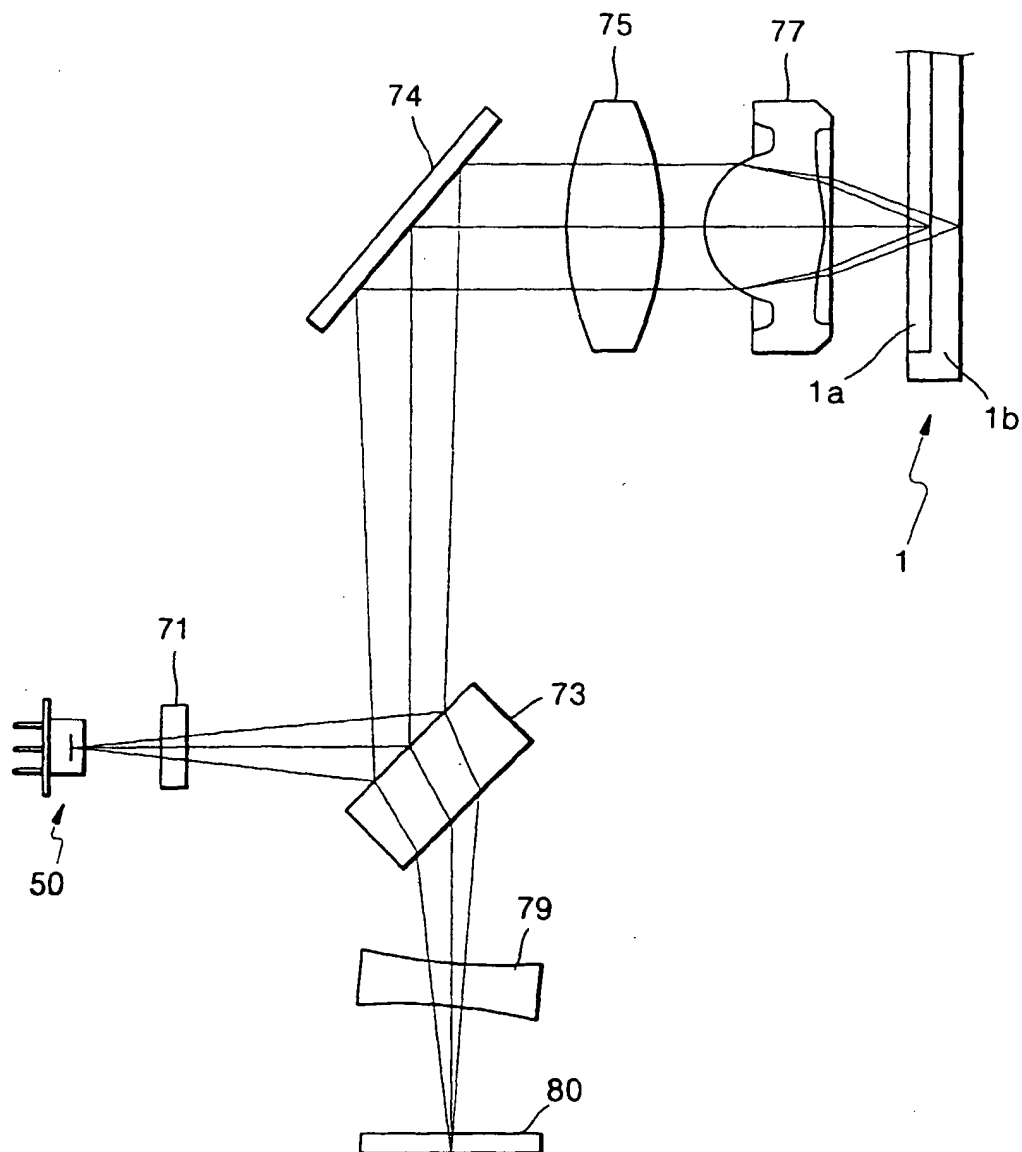
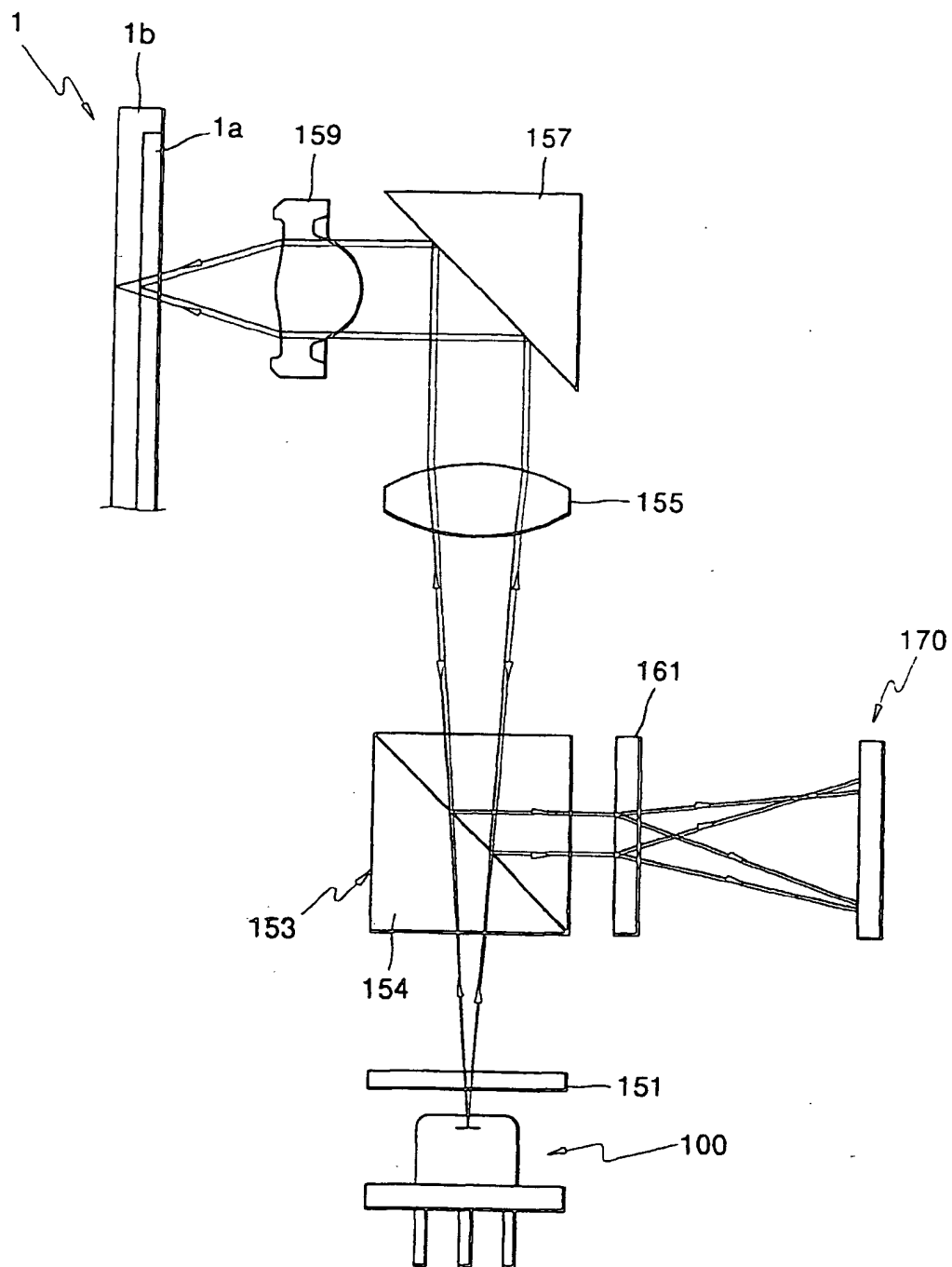
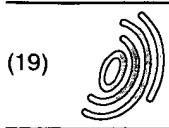


FIG. 9





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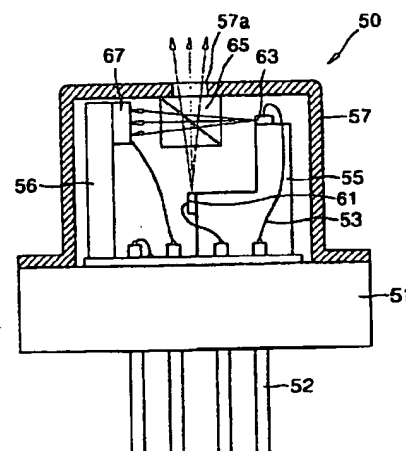
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arranged on an optical path between the light emitting module and the optical path converting device for diffracting and transmitting an incident light, and a photo-detector.

FIG. 3



EP 1 047 051 A3



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EUROPEAN SEARCH REPORT

Application Number
EP 00 30 3274

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	JP 10 172168 A (SAMSUNG ELECTRON CO LTD) 26 June 1998 (1998-06-26) -& US 5 995 476 A (KIM JOO-YOUP) 30 November 1999 (1999-11-30) ◦ abstract; figure 2 * ◦ column 2, line 42 - column 3, line 42 *	1-7	
P, A	EP 00 04614 A (SHIOMOTO TAKEHIRO ; KOHASHI IKUO (JP); SHARP KK (JP)) 27 January 2000 (2000-01-27) ◦ abstract; figures 1-7 *	1-7	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
Place of search THE HAGUE		Date of completion of the search 30 November 2000	Examiner Pariset, N
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03 B2 (P04C01)



European Patent
Office

Application Number

EP 00 30 3274

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- ☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

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